

Since we can't directly see or measure the direction and rate of groundwater flow underground, hydrogeologists (scientists who study groundwater) use computer models to simulate this process. A computer model is a mathematical representation of the physical aspects of the Aquifer, such as its thickness, porosity, hydraulic conductivity (permeability), and other parameters. It is necessary to have good field data on a wide variety of aquifer properties in order to develop a good working model of an aquifer system.

Several groundwater flow models have been constructed for the Aquifer during the last 20 years. The U.S. Geological Survey, Eastern Washington University, and engineering consultants have all created models of the Aquifer

for specific purposes. Models have been used to focus the research efforts on the Aquifer, to help determine the overall water budget of the system, to delineate wellhead capture zones for large municipal wells, to predict potential pathways that contaminants might follow, and to better understand the interaction between the Spokane River and the Aquifer. A new computer model is currently being developed as part of a study of the Aquifer.

An important application of models is prediction of contamination movement in the Aquifer. These models can identify wells that are down-gradient (downstream) from a contamination source. A model was constructed to track a trichloroethylene (TCE) contamination plume near Coeur d'Alene in the early 1990s. The

model assisted local water managers in preventing harmful levels of TCE from entering the drinking water supply.

Computer models can be used to delineate capture zones around important water supply wells (see the text box below.) Capture zone information is useful in determining where appropriate land use activities should be located. Activities that include handling of hazardous and dangerous substances should not be located over the Aquifer in the capture zone for a large well.

Perhaps the most comprehensive use of flow models is estimating the Aquifer water budget. Since we depend on the Aquifer as our sole source of water, models can help us manage Aquifer water use wisely.

## Computer Models Can ...

- ... predict the rate and direction of groundwater flow in the Aquifer.
- ... calculate a water budget (recharge and discharge) for the Aquifer.
- ... predict where contamination may travel in the Aquifer.
- ... define capture zones around important pumping wells.
- ... be a guide to future research needed for understanding the Aquifer.

## Spokane Wells Capture Zone

The main image on this page shows the computer model generated capture zones for the primary City of Spokane wells. A capture zone is the area of the Aquifer up-gradient (upstream) from the well that provides water to the well during a defined period of time (see legend at right.) The 10 year capture zones for some of these wells extend to the east 15 to 20 miles through the Spokane Valley and into Idaho.

## Legend

- City of Spokane well
- Special Capture Zone
- 1 Year Capture Zone
- 5 Year Capture Zone
- 10 Year Capture Zone

## Model Output

The image at right is an example of an Aquifer computer model output. This output shows water levels in the Aquifer as elevations above mean sea level.

## Spokane Valley-Rathdrum Prairie Aquifer System

